STIC Search Report
EIC 1700

USPTO
Scientific & Technical Information Center

STIC Database Tracking Number: 224852

TO: Tony S Chuo
Location: REM 6C11
Art Unit : 1745
May 24, 2007

Case Serial Number: 10/664818

From: Mei Huang
Location: EIC 1700
REMSEN 4B28
Phone: 571/272-3952
Mei.huang@uspto.gov

Search Notes

Examiner Chuo,

Please feel free to contact me if you have any questions or if you would like to refine the search query.

Thank you for using STIC search services!

Regards,
Mei Huang

STIC Search Results Feedback Form

USPTO

EIC17000

Questions about the scope or the results of the search? Contact *the EIC searcher or contact*:

Kathleen Fuller, EIC 1700 Team Leader
571/272-2505 REMSEN 4B28

Voluntary Results Feedback Form

- *I am an examiner in Workgroup:* ☐ *Example: 1713*
- *Relevant prior art **found**, search results used as follows:*

  - ☐ 102 rejection
  - ☐ 103 rejection
  - ☐ Cited as being of interest.
  - ☐ Helped examiner better understand the invention.
  - ☐ Helped examiner better understand the state of the art in their technology.

  Types of relevant prior art found:

  - ☐ Foreign Patent(s)
  - ☐ Non-Patent Literature
    (journal articles, conference proceedings, new product announcements etc.)

- *Relevant prior art **not found**:*

  - ☐ Results verified the lack of relevant prior art (helped determine patentability).
  - ☐ Results were not useful in determining patentability or understanding the invention.

Comments:

Drop off or send completed forms to EIC1700 REMSEN 4B28

Banks, Kendra 224852

From: TONY CHUO [Tony.Chuo@uspto.gov]
Sent: Monday, May 14, 2007 3:45 PM
To: STIC-EIC1700
Subject: Database Search Request, Serial Number: 10664818

Requester:
    TONY CHUO (P/1745)
Art Unit:
    GROUP ART UNIT 1745
Employee Number:
    81950
Office Location:
    REM 06C11
Phone Number:
    (571)272-0717
Mailbox Number:

Case serial number:
    10664818
Class / Subclass(es):
    429/38
Earliest ~~Priority~~ Filing Date:
    9/16/03
Format preferred for results:
    Paper
Search Topic Information:
    A container that supplies a source of fuel to a direct methanol fuel cell, the container comprising:
a) a housing having at least a portion of the wall of the housing being comprised of a thermally conductive material, wherein the remaining portions of the walls of the container are thermally insulating;
b) a fuel egress port supported by the housing; and
c) a surface area planar vaporization membrane residing in the container.
Special Instructions and Other Comments:

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=> fil wpix
FILE 'WPIX' ENTERED AT 18:12:46 ON 24 MAY 2007
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FILE LAST UPDATED:                          23 MAY 2007   <20070523/UP>
MOST RECENT THOMSON SCIENTIFIC UPDATE:      200733        <200733/DW>
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    documents, but they can be identified by 20060101/UPIC and
    20061231/UPIC. <<<

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    PLEASE SEE
http://www.stn-international.de/stndatabases/details/dwpi_r.html <<<


=> d his nofile

     (FILE 'HOME' ENTERED AT 17:06:53 ON 24 MAY 2007)

     FILE 'HCAPLUS' ENTERED AT 17:07:00 ON 24 MAY 2007
L1            1 SEA ABB=ON  PLU=ON  US2005058879/PN

     FILE 'REGISTRY' ENTERED AT 17:07:36 ON 24 MAY 2007
L2            2 SEA ABB=ON  PLU=ON  (1333-74-0/BI OR 67-56-1/BI)
                D SCA

     FILE 'HCAPLUS' ENTERED AT 17:17:28 ON 24 MAY 2007
L3              QUE ABB=ON  PLU=ON  FUEL(A)CELL
L4        17586 SEA ABB=ON  PLU=ON  (DELIVER? OR SUPPLY? OR DIRECT?)(3A)(
                FUEL? OR METHANOL OR CH3OH_)
L5              QUE ABB=ON  PLU=ON  DELIVER? OR SUPPLY? OR DIRECT?
L6              QUE ABB=ON  PLU=ON  FUEL?
L7              QUE ABB=ON  PLU=ON  METHANOL OR CH3OH OR MEOH
L8              QUE ABB=ON  PLU=ON  ETHANOL OR PROPANOL OR ISOPROPANOL
                OR ETOH OR PROH OR IPROH OR (1 OR 2 OR I OR ISO)(W)(PROPA
                NOL OR PROH)
L9        20530 SEA ABB=ON  PLU=ON  L5(3A)(L6 OR L7 OR L8)
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L10         8933 SEA ABB=ON  PLU=ON  L3 AND L9
L11              QUE ABB=ON  PLU=ON  THERMAL?(2A)INSULAT? OR THERMOINSULAT
                 ?
L12           53 SEA ABB=ON  PLU=ON  L10 AND L11
L13              QUE ABB=ON  PLU=ON  THERMAL?(2A)CONDUCT? OR THERMOCONDUCT
                 ?
L14           40 SEA ABB=ON  PLU=ON  L10 AND L13
L15            3 SEA ABB=ON  PLU=ON  L12 AND L14
L16              QUE ABB=ON  PLU=ON  EVAPORAT? OR EVAPOURAT? OR VAPORIZ?
                 OR VAPOURIZ? OR VAPORIS? OR VAPOURIS?
L17              QUE ABB=ON  PLU=ON  MEMBRANE
L18            3 SEA ABB=ON  PLU=ON  (L12 OR L14) AND L16
L19           29 SEA ABB=ON  PLU=ON  (L12 OR L14) AND L17
L20            2 SEA ABB=ON  PLU=ON  (L15 OR L18) AND L19
L21            6 SEA ABB=ON  PLU=ON  L20 OR L15 OR L18

     FILE 'WPIX' ENTERED AT 17:45:03 ON 24 MAY 2007
L22            1 SEA ABB=ON  PLU=ON  US20050058879/PN
L23        48088 SEA ABB=ON  PLU=ON  L5(3A)(L6 OR L7 OR L8)
L24         6980 SEA ABB=ON  PLU=ON  L23 AND L3
L25           28 SEA ABB=ON  PLU=ON  L24 AND L11
L26           36 SEA ABB=ON  PLU=ON  L24 AND L13
L27            4 SEA ABB=ON  PLU=ON  L25 AND L26
L28            9 SEA ABB=ON  PLU=ON  (L25 OR L26) AND L16
L29           15 SEA ABB=ON  PLU=ON  (L25 OR L26) AND L17
L30            2 SEA ABB=ON  PLU=ON  L28 AND L29
L31            5 SEA ABB=ON  PLU=ON  L27 OR L30

     FILE 'COMPENDEX' ENTERED AT 17:51:40 ON 24 MAY 2007
L32            3 SEA ABB=ON  PLU=ON  L24 AND L11
L33           18 SEA ABB=ON  PLU=ON  L24 AND L13
L34            0 SEA ABB=ON  PLU=ON  L32 AND L33
L35            1 SEA ABB=ON  PLU=ON  (L32 OR L33) AND L16
L36           12 SEA ABB=ON  PLU=ON  (L32 OR L33) AND L17
L37            0 SEA ABB=ON  PLU=ON  L35 AND L36

     FILE 'INSPEC' ENTERED AT 17:54:41 ON 24 MAY 2007
L38            2 SEA ABB=ON  PLU=ON  L24 AND L11
L39           21 SEA ABB=ON  PLU=ON  L24 AND L13
L40            0 SEA ABB=ON  PLU=ON  L38 AND L39
L41            0 SEA ABB=ON  PLU=ON  (L38 OR L39) AND L16
L42           16 SEA ABB=ON  PLU=ON  (L38 OR L39) AND L17
L43            0 SEA ABB=ON  PLU=ON  L42 AND L16(5A)L17

     FILE 'PASCAL' ENTERED AT 18:05:45 ON 24 MAY 2007
L44            1 SEA ABB=ON  PLU=ON  L24 AND L11
L45            8 SEA ABB=ON  PLU=ON  L24 AND L13
L46            0 SEA ABB=ON  PLU=ON  L44 AND L45
L47            0 SEA ABB=ON  PLU=ON  (L44 OR L45) AND L16
L48            6 SEA ABB=ON  PLU=ON  (L44 OR L45) AND L17
L49            7 SEA ABB=ON  PLU=ON  L44 OR L48

     FILE 'WPIX' ENTERED AT 18:10:51 ON 24 MAY 2007
                 SEL L31 PN,APPS

     FILE 'HCAPLUS' ENTERED AT 18:11:04 ON 24 MAY 2007
L50            4 SEA ABB=ON  PLU=ON  (US2001-262991P/APPS OR US2001-263010

L51            5 SEA ABB=ON  PLU=ON  L21 NOT L50
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FILE 'HCAPLUS, COMPENDEX, INSPEC, PASCAL' ENTERED AT 18:11:40 ON 24 MAY 2007
L52 14 DUP REM L51 L35 L38 L49 (1 DUPLICATE REMOVED)

=> d l31 ifull 1-5

L31 ANSWER 1 OF 5 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
ACCESSION NUMBER: 2006-564457 [58] WPIX
DOC. NO. NON-CPI: N2006-453644 [58]
TITLE: Heat exchange apparatus for electric vehicle, has foam material arranged at back side, so that sound **insulation** property and **thermal conductivity** was increased
DERWENT CLASS: X16; X21; X27
INVENTOR: TERASAKI T
PATENT ASSIGNEE: (NSMO-C) NISSAN MOTOR CO LTD
COUNTRY COUNT: 1

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
JP 2006205761	A	20060810	(200658)*	JA	7[4]	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
JP 2006205761	A	JP 2005-16757	20050125

PRIORITY APPLN. INFO: JP 2005-16757 20050125
INT. PATENT CLASSIF.:
IPC ORIGINAL: B60K0001-04 [I,A]; B60K0001-04 [I,C]; B60K0011-02 [I,C]; B60K0011-04 [I,A]; B60K0008-00 [I,A]; B60K0008-00 [I,C]
BASIC ABSTRACT:
JP 2006205761 A UPAB: 20060911

NOVELTY - The foam material (29) was arranged at the back side of the metal plate (27), so that the sound **insulation** property and **thermal conductivity** was increased. The metal plate was arranged at the vehicle forward side into the air flow from the radiator (19) side. The heat exchanger (15) was arranged at the metal plate at the vehicle forward side of the outer wall section. The air flow path (3) directs the air to the **fuel cell.**

USE - For electric vehicle using **fuel cell**

.

ADVANTAGE - Reduces the noise generated, while preventing the reduction of the thermal radiation of the heat exchanger apparatus.

DESCRIPTION OF DRAWINGS - The figure shows the perspective diagram of the heat exchanger used for the air **supply** apparatus for **fuel cells.** (Drawing includes non-English language text).

Air flow path (3)
Heat exchanger (15)
Radiator (19)
Metal plate (27)
Foam material (29)

FILE SEGMENT: EPI
MANUAL CODE: EPI: X16-C09; X16-K01; X21-A01F; X21-B01A; X27-F02C

L31 ANSWER 2 OF 5 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
ACCESSION NUMBER: 2006-211555 [22] WPIX
DOC. NO. CPI: C2006-069605 [22]
DOC. NO. NON-CPI: N2006-182067 [22]
TITLE: Hydrogen storage apparatus comprises housing having internal volume and passageway from internal volume and through housing, the internal volume including first material for absorbing hydrogen, and second material
DERWENT CLASS: L03; Q31; X16
INVENTOR: GROSS K; GROSS K J
PATENT ASSIGNEE: (GROS-I) GROSS K; (GROS-I) GROSS K J
COUNTRY COUNT: 109

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20060051638	A1	20060309	(200622)*	EN	27[15]	
WO 2006029027	A1	20060316	(200622)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20060051638	A1	US 2004-934340	20040903
WO 2006029027	A1	WO 2005-US31429	20050902

PRIORITY APPLN. INFO: US 2004-934340 20040903
INT. PATENT CLASSIF.:
IPC ORIGINAL: B65B0003-00 [I,A]; B65B0003-00 [I,C]; C01B0003-00 [I,A]; C01B0003-00 [I,C]; H01M0002-02 [I,A]; H01M0002-02 [I,C]; H01M0008-04 [I,A]; H01M0008-04 [I,A]; H01M0008-04 [I,C]; H01M0008-06 [I,A]; H01M0008-06 [I,A]; H01M0008-06 [I,C]; H01M0008-24 [I,A]; H01M0008-24 [I,C]

BASIC ABSTRACT:

US 20060051638 A1 UPAB: 20060331

NOVELTY - A hydrogen storage apparatus has housing having internal volume and passageway from the internal volume and through the housing. The internal volume includes a first material for absorbing hydrogen and a second material having a higher **thermal conductivity** than the first material.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for an electric power system for a device comprising greater than or equal to2 electric power modules each electrically connected to one other of the electric power modules, where each of the electric power modules includes a **fuel cell** stack operable on hydrogen, and housing in contact with the **fuel cell** and having internal volumes for storing hydrogen and an outlet to provide hydrogen released from the internal volume to the **fuel cell**, where the heat for releasing hydrogen is provided by the **fuel cell** and wiring to provide power from the power modules.

USE - Used for storing hydrogen (claimed).

ADVANTAGE - The invention allows for improved heat transfer into and out of a hydrogen-storage material. The hydrogen-storage

material is segmented into internal volumes that allows for tailoring of the hydrogen storage capabilities and easy replacement of materials. The **fuel cell**-hydrogen storage system has improved thermal matching of the **fuel cell** and hydrogen-storage material.

DESCRIPTION OF DRAWINGS - The figure is a section showing an exploded view of hydride storage beds and **fuel cells.**

Fuel supply line (101)
Fuel cell (120a-d)
Nut (203)
Bipolar plates (223)
Seals (305)

TECHNOLOGY FOCUS:

MECHANICAL ENGINEERING - Preferred Materials: The first material includes greater than or equal to2 materials for absorbing hydrogen. The second material is consisting of a sintered metal, a metal foam or a metal wool. The internal volume includes hydrogen storage material comprising a hydride, a high surface area material, a hydrogen-containing compound, a metal and/or an alloy. The hydride is selected from the group consisting of an alanate, complex hydride, borohydride, ionic hydride, titanium hydride, aluminum hydride, magnesium hydride or intermetallic hydrides. The intermetallic hydride is a rare earth-nickel based hydride, zirconium-manganese based hydride or titanium-iron based hydride. The hydrogen-containing compound consists of amides and imides. It includes a silicon-based hydrogen compound or a carbon-based hydrogen compound.

Preferred Components: The internal volume further includes a spring. The housing further includes a porous material within the passageway. The internal volume includes interconnected cylindrical volumes. The apparatus comprises **fuel cell** (120a-d) stacks each operable on hydrogen and oxygen having 2 fuel stack sides; and housings each in contact with a substantial portion of a **fuel cell** stack side and having internal volume for storing hydrogen and passageway. It includes **thermal insulation** surrounding a portion of the **fuel cell** stack and the housing, and providing a gap for circulating a gas. It further includes a vacuum-tight container surrounding the **fuel cell** and the housing, and a gas source to provide a controllable pressure to the vacuum-tight container. It has a device to control heat loss from the **fuel cell** stack and the housing.

FILE SEGMENT: CPI; GMPI; EPI
MANUAL CODE: CPI: L03-E04
EPI: X16-C09; X16-F01

L31 ANSWER 3 OF 5 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
ACCESSION NUMBER: 2005-282820 [29] WPIX
DOC. NO. NON-CPI: N2005-231778 [29]
TITLE: Container e.g. **fuel** cartridge, for **supplying** source of **fuel** to **direct methanol fuel cell** system, has portion of housing wall with **thermally conductive** material, and fuel egress port that is supported by housing
DERWENT CLASS: Q13; X16
INVENTOR: GUAY G G; GUAY G
PATENT ASSIGNEE: (GILL-C) GILLETTE CO; (GUAY-I) GUAY G G

COUNTRY COUNT: 107

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20050058879	A1	20050317	(200529)*	EN	21[9]	
WO 2005034274	A2	20050414	(200529)	EN		
EP 1668731	A2	20060614	(200641)	EN		
BR 2004014414	A	20061114	(200677)	PT		
CN 1868086	A	20061122	(200720)	ZH		
JP 2007506251	W	20070315	(200722)	JA	20	

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20050058879	A1	US 2003-664818	20030916
BR 2004014414	A	BR 2004-14414	20040908
CN 1868086	A	CN 2004-80029982	20040908
EP 1668731	A2	EP 2004-783382	20040908
WO 2005034274	A2	WO 2004-US29105	20040908
EP 1668731	A2	WO 2004-US29105	20040908
BR 2004014414	A	WO 2004-US29105	20040908
JP 2007506251	W	WO 2004-US29105	20040908
JP 2007506251	W	JP 2006-526929	20040908

FILING DETAILS:

PATENT NO	KIND		PATENT NO
EP 1668731	A2	Based on	WO 2005034274 A
BR 2004014414	A	Based on	WO 2005034274 A
JP 2007506251	W	Based on	WO 2005034274 A

PRIORITY APPLN. INFO: US 2003-664818 20030916
INT. PATENT CLASSIF.:
MAIN: H01M002-14; H01M008-04
SECONDARY: B01B001-00; B01J004-04; B60K015-03
IPC ORIGINAL: H01M0008-04 [I,C]; H01M0008-04 [I,A]; H01M0008-04 [I,C]; H01M0008-10 [I,A]; H01M0008-10 [I,C]
IPC RECLASSIF.: B01B0001-00 [I,A]; B01B0001-00 [I,C]; B01J0004-00 [I,C]; B01J0004-04 [I,A]; B60K0015-03 [I,A]; B60K0015-03 [I,C]; H01M0002-14 [I,A]; H01M0002-14 [I,C]; H01M0008-04 [I,A]; H01M0008-04 [I,C]

BASIC ABSTRACT:

US 20050058879 A1 UPAB: 20051222

NOVELTY - The container e.g. fuel cartridge (12), has a housing whose portion has a **thermally conductive** material. A fuel egress port is supported by the housing. A surface area enhanced planar **vaporization membrane** (44) resides in the container. Remaining portions of the wall is **thermally insulated.** The container has a liquid source of hydrogen e.g. methanol. The **membrane** partitions a liquid phase to a vapor phase.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for a method of using the container e.g. fuel cartridge.

USE - Used for **supplying** a source of **fuel** to a **direct methanol fuel cell** (DMFC) system.

ADVANTAGE - The portion of the housing wall has **thermally conductive** material that enhances a higher **delivery** rate of **methanol** in a vapor phase across the **membrane** to deliver vapor at the egress port of the container. The container allows the **fuel cell** to operate without a need for pumps or other active controls.

DESCRIPTION OF DRAWINGS - The drawing shows a block diagram depicting an electronic device that is powered by a **fuel cell.**

Portable electronic device (10)
Fuel cartridge (12)
Interconnect (16)
Fuel cell (18)
Vaporization membrane (44)

FILE SEGMENT: GMPI; EPI
MANUAL CODE: EPI: X16-C01C; X16-C15A; X16-C15C

L31 ANSWER 4 OF 5 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
ACCESSION NUMBER: 2005-100769 [11] WPIX
CROSS REFERENCE: 2004-118664
DOC. NO. CPI: C2005-033695 [11]
DOC. NO. NON-CPI: N2005-087538 [11]
TITLE: Heating a subterranean formation for in situ mining of fluids e.g. oil and gas, involves inserting into a hole in the formation a heater comprising casing and **fuel cells**, and operating the **fuel cells** to produce heat and electricity
DERWENT CLASS: H01; Q49; X16; X25
INVENTOR: SAVAGE M T
PATENT ASSIGNEE: (INDE-N) INDEPENDENT ENERGY PARTNERS INC; (SAVA-I) SAVAGE M T
COUNTRY COUNT: 2

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
US 20050016729	A1	20050127	(200511)*	EN	58[35]	
CA 2484887	A1	20050415	(200532)	EN		
US 7182132	B2	20070227	(200718)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
US 20050016729	A1 CIP of	US 2002-53207	20020115
US 20050016729	A1	US 2003-687264	20031015
CA 2484887	A1	CA 2004-2484887	20041015

FILING DETAILS:

PATENT NO	KIND		PATENT NO
US 20050016729	A1	CIP of	US 6684948 B

PRIORITY APPLN. INFO: US 2003-687264 20031015
US 2002-53207 20020115
INT. PATENT CLASSIF.:

IPC ORIGINAL: E21B0036-00 [I,C]; E21B0036-04 [I,A]
IPC RECLASSIF.: E21B0036-00 [I,A]; E21B0036-00 [I,C]; E21B0041-00 [I,A]; E21B0041-00 [I,C]; E21B0043-16 [I,C]; E21B0043-24 [I,A]; H01M0008-00 [N,A]; H01M0008-00 [N,C]; H01M0008-04 [I,A]; H01M0008-04 [I,C]; H01M0008-24 [I,A]; H01M0008-24 [I,C]

BASIC ABSTRACT:
US 20050016729 A1 UPAB: 20060121

NOVELTY - Heating a subterranean formation involves forming a hole into the formation; inserting into the hole a heater comprising a casing (34) and **fuel cells** (400) contained within the casing; operating the **fuel cells** so as to produce heat and electricity; and generating gaseous product, which is provided to and used by the **fuel cells** as fuel.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for:

(1) a subterranean formation heater comprising a casing (34) having **fuel cells**, where the **fuel cells** have a feedback connection to the subterranean formation for receiving a fuel from the formation, and where a total fuel used to power the **fuel cells** is supplied via the feedback connection; and

(2) a conduction heater comprising **fuel cells**, conduit (299, 499) each being in gaseous communication with the **fuel cells**, and manifold comprising conduits but no **fuel cells**, where the manifold connects a planetary surface to the **fuel cells**;

(3) a method to start up a down hole conduction heater comprising forming a stack (600) of **fuel cells** in a casing, inserting a stack down a borehole (300), feeding the stack with conduits to **supply** an oxidant and **fuel** to the stack, and bringing a temperature of the stack up to an operating temperature of 750-1000degreesC; and

(4) a **fuel cell** assembly comprising an interconnect plate having a peripheral edge and having a heat conductive structure, **fuel cells** mounted adjacent to the peripheral edge, and channels to the **fuel cell** to provide fuel and oxidant and to transport exhaust gasses.

USE - The method is used for heating a subterranean formation for in situ mining of fluids including oil and gas.

ADVANTAGE - The method utilizes a **fuel cell**, which acts as both a heating element and a power generator, resulting in increased economic efficiency. It converts fuel to heat, like combustion heaters, avoiding the inefficiencies of electrical resistance heaters. It produces heat uniformly over the length of the heater, like electrical resistance heaters, while avoiding hot spots and uneven heating of combustion heaters. It also eliminates the problems associated with mixing fuel and air in flameless combustor heaters.

DESCRIPTION OF DRAWINGS - The figure is a cross-sectional view of Geothermic **Fuel Cell** Modules installed in a resource.

Casing (34)
Conduit (299, 499)
Borehole (300)
Fuel cells (400)
Fuel cell stack (600)

TECHNOLOGY FOCUS:

ELECTRICAL POWER AND ENERGY - Preferred Components: At least after an initial start-up period, the **fuel cells** are fueled by greater than or equal to10% of the gaseous product generated by the formation. Each **fuel cell** has a thickness and an active component surface. It generates a warm exhaust gas which is collected and used to heat the formation. The heater segment has greater than desired combined thermal output if the **fuel cells** were configured continuously within the segment. The stack of **fuel cells** is connected end to end to form a stick of **fuel cell** assemblies. An insulated current return cable is attached to a bottom of the string, thus forming a useful electric potential between a top of the string and the cable.

MECHANICAL ENGINEERING - Preferred Method: The method further comprises filling an annular gap, which is defined by the casing and the hole, with a **thermally conductive** substance. Preferred Components: The manifold comprises **thermal insulation** to inhibit transfer of heat from the manifold to a surrounding environment. It further comprises a heat exchanger. Spacer plates having aligned holes with the interconnect plates are provided to selectively reduce a heat output of the stick.

FILE SEGMENT: CPI; GMPI; EPI
MANUAL CODE: CPI: H01-D06B; H01-D08
EPI: X16-C15A; X16-C15A1; X16-C18; X25-E

L31 ANSWER 5 OF 5 WPIX COPYRIGHT 2007 THE THOMSON CORP on STN
ACCESSION NUMBER: 2003-029983 [02] WPIX
DOC. NO. CPI: C2003-006866 [02]
DOC. NO. NON-CPI: N2003-023711 [02]
TITLE: Apparatus for electrochemical cell, has electrochemical cell electrically conductive support having conductive core which comprises active area covered with electrically and **thermally conductive** polymeric composite
DERWENT CLASS: A85; E36; J03; L03; X16; X25
INVENTOR: BAARS D M; BORGES H P; CHEN S B; EHRENBERG S G; EHRENBERT S G; FITTS B B; JOHNSON B C; LANDI V R; ROY S K; CHUN S B
PATENT ASSIGNEE: (BAAR-I) BAARS D M; (BORG-I) BORGES H P; (CHEN-I) CHEN S B; (DAIS-N) DAIS-ANALYTIC CORP; (EHRE-I) EHRENBERT S G; (FITT-I) FITTS B B; (JOHN-I) JOHNSON B C; (LAND-I) LANDI V R; (ROYS-I) ROY S K; (WORL-N) WORLD PROPERTIES INC
COUNTRY COUNT: 94

PATENT INFORMATION:

PATENT NO	KIND	DATE	WEEK	LA	PG	MAIN IPC
WO 2002080295	A2	20021010	(200302)*	EN	38[11]	
US 20020155333	A1	20021024	(200302)	EN		
GB 2389701	A	20031217	(200407)	EN		
US 20040076863	A1	20040422	(200428)	EN		
AU 2002312570	A1	20021015	(200432)	EN		
JP 2005502981	W	20050127	(200510)	JA	68	
DE 10295503	T5	20050908	(200559)	DE		
US 7138203	B2	20061121	(200677)	EN		

APPLICATION DETAILS:

PATENT NO	KIND	APPLICATION	DATE
WO 2002080295	A2	WO 2002-US19875	20020118
US 20020155333	A1 Provisional	US 2001-262991P	20010119
US 20020155333	A1 Provisional	US 2001-263010P	20010119
US 20040076863	A1 Provisional	US 2001-262991P	20010119
US 20040076863	A1 Provisional	US 2001-263010P	20010119
AU 2002312570	A1	AU 2002-312570	20020118
DE 10295503	T5	DE 2002-10295503	20020118
JP 2005502981	W	JP 2002-578592	20020118
US 20020155333	A1	US 2002-53346	20020118
US 20040076863	A1 CIP of	US 2002-53346	20020118
GB 2389701	A	WO 2002-US19875	20020118
JP 2005502981	W	WO 2002-US19875	20020118
DE 10295503	T5	WO 2002-US19875	20020118
US 20040076863	A1	US 2003-638117	20030807
GB 2389701	A	GB 2003-19464	20030819
US 7138203	B2 Provisional	US 2001-262991P	20010119
US 7138203	B2 Provisional	US 2001-263010P	20010119
US 7138203	B2 CIP of	US 2002-53346	20020118
US 7138203	B2	US 2003-638117	20030807

FILING DETAILS:

PATENT NO	KIND	PATENT NO
GB 2389701 A	Based on	WO 2002080295 A
AU 2002312570 A1	Based on	WO 2002080295 A
JP 2005502981 W	Based on	WO 2002080295 A
DE 10295503 T5	Based on	WO 2002080295 A

PRIORITY APPLN. INFO: US 2001-263010P 20010119
US 2001-262991P 20010119
US 2002-53346 20020118
US 2003-638117 20030807

INT. PATENT CLASSIF.:
MAIN: H01M008-02
SECONDARY: H01M008-24
IPC ORIGINAL: H01M0002-08 [I,A]; H01M0002-08 [I,C]; H01M0002-14 [I,A]; H01M0002-14 [I,C]; H01M0008-04 [I,A]; H01M0008-04 [I,C]
IPC RECLASSIF.: C25B0009-04 [I,A]; C25B0009-04 [I,C]; H01M0008-02 [I,A]; H01M0008-02 [I,C]; H01M0008-04 [N,A]; H01M0008-04 [N,C]

BASIC ABSTRACT:

WO 2002080295 A2 UPAB: 20060118

NOVELTY - An electrochemical cell apparatus has an electrochemical cell electrically conductive support (10) comprising a conductive core. The conductive core comprises an active area which is covered with an electrically and **thermally conductive** polymeric composite (12).

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are included for the following:

(1) A system, which has conductive support, a gas **supply** unit for **supplying fuel** gases and oxidant gases to the **fuel cell membranes**, electrical unit for transporting electrical

charge to and from the **fuel cell membranes**, electrical unit for conditioning power produced by **fuel cell membranes**, and control unit for controlling the fuel gases, oxidant gases and electrical unit; and

(2) An electrochemical cell component which has a conductive core, and an electrically and **thermally conductive** polymer composite covering and adhered to core by an adhesion promoter. The electrochemical cell component has a volume resistivity of 0.116 OMEGA cm or less.

USE - For electrochemical cell.

ADVANTAGE - The conductive support has excellent chemical resistance, resistance to hydrolysis, good mechanical integrity, roughness and good conductivity. The conductive support has a volume resistivity of 0.5 OMEGA cm or less, preferably 0.045 OMEGA cm or less and **thermal conductivity** of at least 5 watts/m K, preferably at least 13 watts/m K. The conductive support is produced economically from inexpensive raw materials. The connectors support allows the heat generated by the electrochemical cell to be laterally conducted and transferred to circulating fluids such as air, thus the complexity of the support and its manufacture are reduced. The use of thin layer of adhesion promoter between the core and the polymeric composite reduces the tendency of the core and polymeric composite to debond and disparity in the dimensional stability of the core and polymer composite, without decreasing electrical and **thermal conductivity.**

DESCRIPTION OF DRAWINGS - The figure shows the cross-sectional view of an electrochemical cell electrically conductive support.

Electrochemical cell electrically conductive support (10)

Electrically and **thermally conductive** polymeric composite (12)

TECHNOLOGY FOCUS:

INORGANIC CHEMISTRY - Preferred Metal: The conductive core comprises a metal or metal alloy selected from aluminum, copper, nickel, platinum, titanium, gold plated metals, stainless steel and magnesium.

POLYMERS - Preferred Compounds: The conductive polymer composite is a polybutadiene- or polyisoprene-based composite which comprises conductive filler (10-90 volume%), thermosetting polybutadiene or polyisoprene resin, unsaturated butadiene- or isoprene-containing polymer, functionalized liquid polybutadiene or polyisoprene resin, and monomer(s) with vinyl unsaturation selected from styrene, vinyl toluene, divinyl benzene, triallylcyanurate, diallylphthalate, and multifunctional acrylate monomers. The conductor filler in the form of fiber and/or platelets, is synthetic graphite. The poly butadiene or polyisoprene resin is epoxidized phenol novalac resin or epoxidized cresol novalac resin. The unsaturated butadiene or isoprene-containing polymer is a copolymer of isoprene or butadiene and another monomer, or block copolymer such as styrene-butadiene or methyl styrene-butadiene di-block polymer or a thermoplastic elasotmer block copolymer. The adhesion promoter is silane such as mercapto-functional silane or vinyl silane, titanate, or zirconate adhesion promoter.

MECHANICAL ENGINEERING - Preferred Components: The conductive support further has at least one channel for conducting fluid which is an exterior channel for conducting fuel gas, fuel liquid, oxidant gas or oxidant liquid, or an interior channel for conducting cooling fluid. The conductive core further has heat

transfer area in a form of a cooling fin. Preferred Properties: A thermal coefficient of expansion of the conductive core is same as a thermal coefficient of expansion of the conductive polymer composite, over an operative temperature range of **fuel cell.** The conductive support has volume resistivity of less than 0.5 OMEGA cm and a **thermal conductivity** of at least 5 watts/meter degreesK.

EXTENSION ABSTRACT:

EXAMPLE - Aluminum plates with thickness of 0.07 cm, width of 10.7 cm and length of 11 cm, were lightly abraded with sand-paper or using other abrading units. The aluminum plates were then washed with acetone and then pretreated with A1106 (solution of amino silane) (5 weight% (weight%)), in acetone by dip coating. Then, the solvent was allowed to **evaporate** under ambient conditions. The plate was subsequently transferred to a preheated die. A conductive epoxy-based composite material comprising (in volume%) Sumiepoxy ESCN 195XL 25 (epoxidized cresol novolac resin) (11.73), Epiclon N-770 (epoxidized phenol novolac resin) (10.14), Asbury 3621 (natural graphite) (40.02), Asbury A99 (synthetic graphite) (20.69), calcium stearate (3.45), HRJ 11040 (phenol-formaldehyde polymer) (13.59), Ancamine K54 (2,4,6-tris dimethyl-amino methyl phenol) (0.21) and Lonzest GMS (glycerol mono stearate) (0.17), was filled in the mold cavity. The composite was compression molded onto the surface of the plate at 180degreesC mold temperature, 10000-12000 pounds/square inch (psi) cavity pressure for 4 minutes. The molded conductive polymer composite was cured at 240degreesC for 4 hours and an electrochemical cell electrically conductive support was obtained. An apparatus having the obtained support having active area covered with the polymeric composite, was obtained. The obtained support had very good electrical and solvent resistance properties and excellent mechanical integrity. The obtained support was rigid with good dimensional stability. As the obtained support was heated and cooled in cooling cycles, no bowing of the support was noted, thus temperature coefficient of expansion of the polymeric composite was same as the temperature coefficient of the aluminum. The obtained support had volume resistivity of 0.068 OMEGA-cm according to IPC TM-650 and a **thermal conductivity** of 13.4 watts/m K according to ASTM C518.

FILE SEGMENT: CPI; EPI

MANUAL CODE: CPI: A04-B01E; A08-M09A; A08-R01; A09-A03; A12-E06; E05-E01; E05-E02D; E05-G09A; E05-G09B; E05-L01; E05-M; E35-L; J03-B02; L03-E04; L03-E04B
EPI: X16-C01; X16-E06A; X25-R01A

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=> fil hcap
FILE 'HCAPLUS' ENTERED AT 18:13:07 ON 24 MAY 2007
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FILE COVERS 1907 - 24 May 2007 VOL 146 ISS 22
FILE LAST UPDATED: 23 May 2007 (20070523/ED)

New CAS Information Use Policies, enter HELP USAGETERMS for details.

This file contains CAS Registry Numbers for easy and accurate
substance identification.

=> fil compend
FILE 'COMPENDEX' ENTERED AT 18:13:11 ON 24 MAY 2007

FILE LAST UPDATED: 21 MAY 2007 <20070521/UP>
FILE COVERS 1970 TO DATE.

<<< SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN
THE BASIC INDEX >>>

=> fil inspec
FILE 'INSPEC' ENTERED AT 18:13:17 ON 24 MAY 2007

FILE LAST UPDATED: 21 MAY 2007 <20070521/UP>
FILE COVERS 1898 TO DATE.

<<< SIMULTANEOUS LEFT AND RIGHT TRUNCATION AVAILABLE IN
THE ABSTRACT (/AB), BASIC INDEX (/BI) AND TITLE (/TI) FIELDS >>>

=> fil pascal
FILE 'PASCAL' ENTERED AT 18:13:22 ON 24 MAY 2007

FILE LAST UPDATED: 21 MAY 2007 <20070521/UP>
FILE COVERS 1977 TO DATE.

>>> SIMULTANEOUS LEFT AND RIGHT TRUNCATION IS AVAILABLE
IN THE BASIC INDEX (/BI) FIELD <<<

=> d 152 iall 1-14

L52 ANSWER 1 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2006:1119155 HCAPLUS
DOCUMENT NUMBER: 145:457645
ENTRY DATE: Entered STN: 26 Oct 2006
TITLE: Novel materials for alkaline **fuel cells**
INVENTOR(S): Abson, Nicholas M.; Middleton, Peter Hugh
PATENT ASSIGNEE(S): Fr.

SOURCE: Eur. Pat. Appl., 8pp.
CODEN: EPXXDW
DOCUMENT TYPE: Patent
LANGUAGE: English
CLASSIFICATION: 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
EP 1715538	A1	20061025	EP 2005-8535	20050419

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR, BG, CZ, EE, HU, PL, SK, BA, HR, IS, YU

PRIORITY APPLN. INFO.: EP 2005-8535 20050419

PATENT CLASSIFICATION CODES:

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES
EP 1715538	IPCI	H01M0004-86 [I,A]; H01M0008-08 [I,A]; H01M0008-02 [I,A]
	ECLA	H01M004/88; H01M008/02C4C; H01M008/08A

ABSTRACT:
This invention describes the use of conducting porous graphite foam materials as electrodes, catalyst supports, gas diffusion layers and other components in alkaline **fuel cells** and others such as the proton exchange **membrane fuel cell.**
The porous open structure of the graphite material is ideally suited to vapor deposition of catalyst materials. Porous graphite foams can be made by the pyrolysis of pitch at high temps. Alternatively they can be made by the pyrolysis of certain polymer compds. which can create a foam structure during the curing process. Although the exact microstructure of the final graphite foam depends on many factors, they all possess key phys. properties which are relevant to the invention described here such as high **thermal conductivity** and high elec. conductivity The foam can also be used in its powdered form as a conductive additive to gas diffusion layers, electrodes and bi-polar plates.

SUPPL. TERM: **fuel cell** conducting porous graphite foam material
INDEX TERM: **Fuel cells**
(alkaline **fuel cells**; materials for alkaline **fuel cells**)
INDEX TERM: **Fuel cell** electrodes
(catalytic; materials for alkaline **fuel cells**)
INDEX TERM: Vapor deposition process
(chemical; materials for alkaline **fuel cells**)
INDEX TERM: Coating process
(dip; materials for alkaline **fuel cells**)
INDEX TERM: **Fuel cells**
(**direct methanol**; materials for

alkaline **fuel cells**)
INDEX TERM: Catalysts
(electrocatalysts; materials for alkaline **fuel cells**)
INDEX TERM: Coating process
(electroless; materials for alkaline **fuel cells**)
INDEX TERM: Spraying
(electrospraying; materials for alkaline **fuel cells**)
INDEX TERM: Carbon fibers, uses
ROLE: DEV (Device component use); USES (Uses)
(fabrics, graphitized; materials for alkaline **fuel cells**)
INDEX TERM: **Fuel cell** electrodes
(gas diffusion; materials for alkaline **fuel cells**)
INDEX TERM: Electrodeposition
Evaporation
Screen printing
Sputtering
(materials for alkaline **fuel cells**)
INDEX TERM: Borides
ROLE: CAT (Catalyst use); USES (Uses)
(materials for alkaline **fuel cells**)
INDEX TERM: Fluoropolymers, processes
ROLE: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(materials for alkaline **fuel cells**)
INDEX TERM: Perovskite-type crystals
(oxides; materials for alkaline **fuel cells**)
INDEX TERM: Foams
(porous graphite; materials for alkaline **fuel cells**)
INDEX TERM: **Fuel cells**
(proton exchange **membrane**; materials for alkaline **fuel cells**)
INDEX TERM: Vapor deposition process
(vacuum; materials for alkaline **fuel cells**)
INDEX TERM: Spraying
(wet; materials for alkaline **fuel cells**)
INDEX TERM: 7440-02-0, Nickel, uses
ROLE: CAT (Catalyst use); USES (Uses)
(Raney; materials for alkaline **fuel cells**)
INDEX TERM: 7782-42-5, Graphite, uses
ROLE: DEV (Device component use); USES (Uses)
(foam, porous; materials for alkaline **fuel cells**)
INDEX TERM: 7440-06-4, Platinum, uses
ROLE: CAT (Catalyst use); USES (Uses)
(materials for alkaline **fuel cells**)
INDEX TERM: 9002-84-0, PTFE
ROLE: PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(materials for alkaline **fuel cells**)
INDEX TERM: 67-56-1, Methanol, uses

ROLE: TEM (Technical or engineered material use); USES (Uses)
(materials for alkaline **fuel cells**)

INDEX TERM: 7440-44-0, Carbon, uses
ROLE: DEV (Device component use); USES (Uses)
(paper, graphitized; materials for alkaline **fuel cells**)

REFERENCE COUNT: 5 THERE ARE 5 CITED REFERENCES AVAILABLE FOR THIS RECORD.

REFERENCE(S):
(1) Cisar; US 6054228 A 2000 HCAPLUS
(2) Dornier Gmbh; DE 19647534 A1 1998 HCAPLUS
(3) Licentia Patent-Verwaltungs-Gmbh; DE 2101777 A1 1972 HCAPLUS
(4) Licentia Patentverwaltungs Gmbh; GB 1379846 A 1975
(5) Mitsubishi Gas Chemical Company Inc; EP 1225160 A 2002 HCAPLUS

L52 ANSWER 2 OF 14 PASCAL

ACCESSION NUMBER: 2006-0273691 PASCAL

TITLE (IN ENGLISH): Proton conductivity and characterization of novel composite **membranes** for medium-temperature **fuel cells**
International Congress on **Membranes** and **Membrane** Processes: August 21-26, 2005, Seoul, Korea

AUTHOR: AHMAD M. I.; ZAIDI S. M. J.; RAHMAN S. U.
CORPORATE SOURCE: Department of Chemical Engineering, King Fahd University of Petroleum & Minerals (KFUPM), Dhahran-31261, Saudi Arabia

SOURCE: Desalination : (Amsterdam), (2006), 193(1-3), 387-397, 17 refs.
Conference: ICOM International Congress on Membranes and Membrane Processes, Seoul (Korea, Republic of), 21 Aug 2005
ISSN: 0011-9164 CODEN: DSLNAH
DOCUMENT TYPE: Journal; Conference
BIBLIOGRAPHIC LEVEL: Analytic
COUNTRY: Netherlands
LANGUAGE: English
AVAILABILITY: INIST-12906, 354000142613670520

ABSTRACT: **Direct methanol fuel cells** (DMFC) have received considerable attention both as a portable power source and as a replacement for batteries. The available conventional Nafion **membranes** currently used in hydrogen **fuel cells** are not suitable for use in DMFC due to their dehydration and instability at temperatures higher than 100°C. Novel composite **membranes** have been prepared with the help of a sulfonated polyether ether ketone (SPEEK) polymer and a novel solid proton conductor, namely heteropolyacid-loaded Y-zeolite. The novel solid proton conductor has high proton **conductivity** and high **thermal** and structural stability because of the presence of Y-zeolite. The conductivity

of the composite **membranes** at room temperature as well as at higher temperatures was found to increase with the incorporation of solid conducting material particles into the SPEEK polymer. The conductivity increased by 3-4 times at room temperature and increased to exceptionally high values at temperatures higher than 100°C. In all cases the presence of the solid proton conductor led to an increase in conductivity of the **membranes** without detriment to their flexibility. Water uptake of the **membranes** also followed a similar trend as that of conductivity. The **membranes** were characterized by XRD, FTIR and SEM techniques, which confirmed even distribution of solid material into the SPEEK polymer. Hence, these low-cost **membranes** can be considered for use in DMFC for portable devices as well as for medium-temperature stationary applications.

CLASSIFICATION CODE: 001D16; Applied sciences; Pollution, Nuisances
001D06D03E; Applied sciences; Energy; Thermal use of fuels
230; Energy

CONTROLLED TERM: Composite material; **Fuel cell** ; Hydrogen **fuel cells**; Dehydration; Instability; Conducting material; Zeolite; Stability; Flexibility; Water absorption; Trend analysis; Scanning electron microscopy

L52 ANSWER 3 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2005:1191997 HCAPLUS
DOCUMENT NUMBER: 143:462855
ENTRY DATE: Entered STN: 09 Nov 2005
TITLE: Electrically heated reactor for gas phase reforming to produce syngas
INVENTOR(S): Laflamme, Claude B.; Petitclerc, Michel; Labrecque, Raynald
PATENT ASSIGNEE(S): Hydro-Quebec, Can.
SOURCE: Can. Pat. Appl., 99 pp.
CODEN: CPXXEB
DOCUMENT TYPE: Patent
LANGUAGE: English
INT. PATENT CLASSIF.:
MAIN: C01B003-32
SECONDARY: C10L003-00; C01B003-02; B01J019-08; C01B003-36
CLASSIFICATION: 51-11 (Fossil Fuels, Derivatives, and Related Products)
Section cross-reference(s): 47
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
CA 2469859	A1	20051105	CA 2004-2469859	20040505

PRIORITY APPLN. INFO.: CA 2004-2469859

200405
05

PATENT CLASSIFICATION CODES:

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES
CA 2469859	ICM	C01B003-32
	ICS	C10L003-00; C01B003-02; B01J019-08; C01B003-36
	IPCI	C01B0003-32 [ICM,7]; C10L0003-00 [ICS,7]; C01B0003-02 [ICS,7]; B01J0019-08 [ICS,7]; C01B0003-36 [ICS,7]; C01B0003-00 [ICS,7,C*]
	IPCR	B01J0019-08 [I,C*]; B01J0019-08 [I,A]; C01B0003-00 [I,C*]; C01B0003-02 [I,A]; C01B0003-32 [I,A]; C01B0003-34 [I,A]; C01B0003-36 [I,A]; C01B0003-38 [I,A]; C10L0003-00 [I,C*]; C10L0003-00 [I,A]
	ECLA	B01D053/32B; B01J008/02B4; B01J008/02H; B01J019/08D2; B01J019/24R6; C01B003/34G; C01B003/38D

ABSTRACT:
A reactor for reforming a hydrocarbon-containing gas in the presence of an oxidant to produce syngas consists of a housing, and a reaction chamber equipped with two electrodes and filled with a **thermally** ***conductive*** , catalytically active material. The filling is elec. insulated from the metal walls of the reactor housing. The electrodes are hollow and consist of a tube and a perforated disk being in contact with the reactor filling. One of the electrodes is the conduit for feeding the gas being reformed and the oxidant. The other electrode serves as an outlet of the reformate. The reactor filling is soft steel wool containing at least 80% group VIII elements, preferably Fe, Ni, and Co. The hydrocarbon feed can be natural gas, biogas, and C1-12 hydrocarbons. The oxidant can be CO2, CO, H2O, O2, or NOx. The hydrocarbon feed can contain sulfur which reacts with the reactor filling. The produced synthesis gas can be used for the production of **methanol**, and hydrogen **supply** of **fuel cells**.

SUPPL. TERM: elec heated reactor electrode hydrocarbon gas reforming oxidant syngas

INDEX TERM: Fuel gases
(biogas; elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: Electric heating
Electrolytic cells
Steam
Synthesis gas
(elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: Fluoropolymers, uses
ROLE: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: Natural gas, reactions
ROLE: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: Electrodes
(hollow; elec. heated reactor for gas phase

reforming to produce syngas)

INDEX TERM: Synthesis gas manufacturing
(reforming synthesis gas manufacturing; elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: Asbestos
ROLE: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(**thermal insulator**; elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: 9002-84-0, Teflon
ROLE: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(Teflon, elec. insulator; elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: 630-08-0P, Carbon monoxide, preparation 1333-74-0P, Hydrogen, preparation
ROLE: CPS (Chemical process); IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: 74-82-8, Methane, reactions 124-38-9, Carbon dioxide, reactions
ROLE: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: 11121-90-7, Carbon steel, uses
ROLE: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(electrodes; elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: 1344-28-1, Alumina, uses
ROLE: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(interior reactor wall coating; elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: 869003-17-8, BullDog, uses
ROLE: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(reactor filling; elec. heated reactor for gas phase reforming to produce syngas)

INDEX TERM: 12597-68-1, Stainless steel, uses
ROLE: DEV (Device component use); USES (Uses)
(reactor wall; elec. heated reactor for gas phase reforming to produce syngas)

L52 ANSWER 4 OF 14 HCAPLUS

ACCESSION NUMBER: 2004:820248 HCAPLUS
DOCUMENT NUMBER: 141:317224
ENTRY DATE: Entered STN: 07 Oct 2004
TITLE: **Fuel cell** power generator for mobile electronic appliance
INVENTOR(S): Yamauchi, Hisashi; Matsuoka, Takashi; Takashita, Masahiro; Akita, Masato
PATENT ASSIGNEE(S): Toshiba Corp., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 23 pp.
CODEN: JKXXAF

DOCUMENT TYPE: Patent
LANGUAGE: Japanese
INT. PATENT CLASSIF.:
MAIN: H01M008-24
SECONDARY: H01M008-04; H01M008-10
CLASSIFICATION: 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004281072	A	20041007	JP 2003-66766	20030312
PRIORITY APPLN. INFO.:			JP 2003-66766	20030312

PATENT CLASSIFICATION CODES:

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES
JP 2004281072	ICM	H01M008-24
	ICS	H01M008-04; H01M008-10
	IPCI	H01M0008-24 [ICM,7]; H01M0008-04 [ICS,7]; H01M0008-10 [ICS,7]
	IPCR	H01M0008-04 [I,A]; H01M0008-04 [I,C*]; H01M0008-10 [N,A]; H01M0008-10 [N,C*]; H01M0008-24 [I,A]; H01M0008-24 [I,C*]
	FTERM	5H026/AA08; 5H026/CX05; 5H026/HH00; 5H026/HH02; 5H026/HH06; 5H027/AA08; 5H027/BA13

ABSTRACT:
The claimed power plant is equipped with a plurality of stacks consisting of laminated unit cells, where the each stack is covered with a heat ***insulating*** layer showing **thermal conductivity** ≤0.1 (W/m/K) and satisfies P/S 20-31 (P = power output (mW) of the each stack; S = surface area (cm2) of the each stack). The power generator, especially suitable for **direct-methanol** ***fuel*** **cells**, provides high volume efficiency and power output.

SUPPL. TERM: **direct methanol fuel cell** heat insulator
INDEX TERM: **Thermal insulators**
(**fuel cell** power generator containing heat insulator for mobile electronic appliance)
INDEX TERM: **Fuel cells**
(power plants; **fuel cell** power generator containing heat insulator for mobile electronic appliance)

L52 ANSWER 5 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN
ACCESSION NUMBER: 2004:77098 HCAPLUS
DOCUMENT NUMBER: 140:131103
ENTRY DATE: Entered STN: 30 Jan 2004
TITLE: **Fuel cell** having heat conduction mechanism and small electric devices
INVENTOR(S): Nakakubo, Toru; Eguchi, Takeshi; Watabe,

Mitsuhiro
PATENT ASSIGNEE(S): Canon Inc., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 22 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
INT. PATENT CLASSIF.:
MAIN: H01M008-04
SECONDARY: H01M008-10
CLASSIFICATION: 52-2 (Electrochemical, Radiational, and Thermal Energy Technology)
Section cross-reference(s): 76
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2004031096	A	20040129	JP 2002-185052	20020625
PRIORITY APPLN. INFO.:			JP 2002-185052	20020625

PATENT CLASSIFICATION CODES:

PATENT NO.	CLASS	PATENT FAMILY CLASSIFICATION CODES
JP 2004031096	ICM	H01M008-04
	ICS	H01M008-10
	IPCI	H01M0008-04 [ICM,7]; H01M0008-10 [ICS,7]
	IPCR	H01M0008-10 [I,C*]; H01M0008-10 [I,A]; H01M0008-04 [I,C*]; H01M0008-04 [I,A]
	FTERM	5H026/AA06; 5H026/CC01; 5H026/CX04; 5H026/HH03; 5H026/HH06; 5H026/HH08; 5H027/AA06; 5H027/CC02; 5H027/CC03; 5H027/CC04; 5H027/CC06; 5H027/CC15; 5H027/DD00; 5H027/KK46; 5H027/KK48

ABSTRACT:
The **fuel cell** comprises a fuel tank, an elec. generator cell, a cylinder covering the elec. generator cell, wherein the fuel tank has a heat insulating structure therein, or a heat conduction mechanism having smaller heat resistance than that of the natural heat conduction is disposed between the elec. generator cell and the cylinder. The heat conduction mechanism maintains temps. in the **fuel** ***cell*** at an appropriate temperature for the high output voltage.

SUPPL. TERM: **fuel cell** heat conduction mechanism small elec device; **direct methanol fuel cell** DMFC; polymer electrolyte **fuel cell** PEFC
INDEX TERM: Electric apparatus
Fuel cells
Thermal conductors
Thermal insulators
(**fuel cell** having heat conduction mechanism for small elec. devices)

L52 ANSWER 6 OF 14 COMPENDEX COPYRIGHT 2007 EEI on STN
ACCESSION NUMBER: 2004(36):4394 COMPENDEX
TITLE: SOFC anode recycle effect on diesel reforming.

AUTHOR: Borup, Rodney L. (Los Alamos National Lab. MST-11 MS J579, Los Alamos, NM 87545, United States); Inbody, Michael A.; Tafoya, Jose I.; Guidry, Dennis R.; Parkinson, W. Jerry
MEETING TITLE: 2004 AIChE Spring National Meeting, Conference Proceedings.
MEETING ORGANIZER: American Institute of Chemical Engineers, AIChE
MEETING LOCATION: New Orleans, LA, United States
MEETING DATE: 25 Apr 2004-29 Apr 2004
SOURCE: 2004 AIChE Spring National Meeting, Conference Proceedings 2004.p 147-154
SOURCE: 2004 AIChE Spring National Meeting, Conference Proceedings 2004.p 147-154
ISBN: 0816909423
PUBLICATION YEAR: 2004
MEETING NUMBER: 63429
DOCUMENT TYPE: Conference Article
TREATMENT CODE: Theoretical; Experimental
LANGUAGE: English
ABSTRACT: Diesel fuel reforming was **conducted** under iso-**thermal** conditions and under real adiabatic conditions examining reforming operating conditions such as solid oxide **fuel cells** (SOFC) anode recycle and carbon formation. **Direct fuel** injection via a fuel nozzle for adiabatic operation was developed. The control of the fuel/air feed temperature was critical to prevent pre-**vaporization** and vapor locking of the fuel nozzle. Short periods of operation show stable performance, but catalyst deactivation was observed upon shut-down and restart of the reformer.(Edited abstract)
CLASSIFICATION CODE: 702.2 Fuel Cells; 802.2 Chemical Reactions; 714.1 Electron Tubes; 452.3 Industrial Wastes; 803 Chemical Agents; 804 Chemical Products Generally
CONTROLLED TERM: *Solid oxide **fuel cells**; Computer simulation; Nozzles; Diesel fuels; Heat exchangers; Integration; Reforming reactions; Anodes; Recycling; Catalysts
SUPPLEMENTARY TERM: Infrastructures; Diesel reforming; Vehicular auxiliary power units; Anode exhausts

L52 ANSWER 7 OF 14 PASCAL
ACCESSION NUMBER: 2004-0213093 PASCAL
TITLE (IN ENGLISH): Direct synthesis of sulfonated aromatic poly(ether ether ketone) proton exchange **membranes** for **fuel cell** applications
AUTHOR: GIL M.; JI X.; LI X.; NA H.; HAMPSEY J. E.; LU Y.
CORPORATE SOURCE: Department of Chemistry Jilin University, Changchun 130021, China
SOURCE: Journal of Membrane Science, (2004), 234(1-2), 75-81, 15 refs.
ISSN: 0376-7388 CODEN: JMESDO
DOCUMENT TYPE: Journal
BIBLIOGRAPHIC LEVEL: Analytic

COUNTRY: Netherlands
LANGUAGE: English
AVAILABILITY: INIST-17232
ABSTRACT:
Proton exchange **membrane fuel cells** (PEMFC) are promising new power sources for vehicles and portable devices. **Membranes** currently used in PEMFC are perfluorinated polymers such as Nafion°registered trademark<pilcrow>. Even though such **membranes** have demonstrated good performances and long-term stability, their high cost and methanol crossover makes them unpractical for large-scale production. Sulfonated aromatic poly(ether ether ketones) (S-PEEKs) based **membranes** have been studied due to their good mechanical properties, **thermal** stability and **conductivity.** In this study, PEEK **membranes** directly prepared from the sulfonated monomer were evaluated for possible **fuel cell** applications by determining the degree of sulfonation, water swelling, proton conductivity, methanol diffusivity and thermal stability. As synthesized S-PEEK **membranes** exhibit conductivities (25°C) from 0.02 to 0.07S/cm, water swelling from 13 to 54%, ion-exchange capacities (IEC) from 0.7 to 1.5meq/g and methanol diffusion coefficients from 3 x 10-7 to 5 x 10 -8cm2/s at 25°C. These diffusion coefficients are much lower than that of Nafion°registered trademark<pilcrow> (2 x 10 -6cm 2/s), making S-PEEK **membranes** a good alternative to reduce problems associated with high **methanol** crossover in **direct methanol fuel cells.**

CLASSIFICATION CODE:
001D07; Applied sciences; Chemical engineering
001D09; Applied sciences; Physicochemistry of polymers, Macromolecular chemistry, Materials science
001D08A03; Applied sciences; Chemistry; Chemical industry
001D06D03E; Applied sciences; Energy; Thermal use of fuels
001B30; Physics; Atomic physics, Molecular physics
001B00C40; Physics; Classical physics
230; Energy

CONTROLLED TERM: Proton exchange **membranes** (PEM); Proton exchange **membrane fuel cells** (PEMFC); Proton conductivity; Ion-exchange capacities; Application; Polyether ether ketones; Aromatic compounds; **Fuel cells**; Protons; Methanol; Diffusion; Thermodynamic stability; Synthesis (chemical); Ion exchange **membranes**; Theory; Experiments

L52 ANSWER 8 OF 14 INSPEC (C) 2007 IET on STN

ACCESSION NUMBER: 2004:8006116 INSPEC

DOCUMENT NUMBER: B2004-08-8410G-015

TITLE: A microreactor for hydrogen production in micro **fuel cell** applications

AUTHOR: Pattekar, A.V.; Kothare, M.V. (Dept. of Chem. Eng., Lehigh Univ., Bethlehem, PA, USA)

SOURCE: Journal of Microelectromechanical Systems (Feb. 2004), vol.13, no.1, p. 7-18, 31 refs.
CODEN: JMIYET, ISSN: 1057-7157
SICI: 1057-7157(200402)13:1L.7:MHPM;1-N
Price: 1057-7157/04/$20.00
Published by: IEEE, USA

DOCUMENT TYPE: Journal

TREATMENT CODE: Experimental

COUNTRY: United States

LANGUAGE: English

ABSTRACT: A silicon-chip based microreactor has been successfully fabricated and tested for carrying out the reaction of methanol reforming for microscale hydrogen production. The developed microreactor in combination with a micro **fuel cell** is proposed as an alternative to conventional portable sources of electricity such as batteries due to its ability to provide an uninterrupted supply of electricity as long as a **supply** of **methanol** and water can be provided. The microreformer-**fuel cell** combination has the advantage of not requiring the tedious recharging cycles needed by conventional rechargeable lithium-ion batteries. It also offers significantly higher energy storage densities, which translates into less frequent 'recharging' through the refilling of methanol fuel. The microreactor consists of a network of catalyst-packed parallel microchannels of depths ranging from 200 to 400 μm with a catalyst particle filter near the outlet fabricated using photolithography and deep-reactive ion etching (DRIE) on a silicon substrate. Issues related to microchannel and filter capping, on-chip heating and temperature sensing, introduction and trapping of catalyst particles in the microchannels, flow distribution, microfluidic interfacing, and **thermal insulation** have been addressed. Experimental runs have demonstrated a methanol to hydrogen molar conversion of at least 85% to 90% at flow rates enough to supply hydrogen to an 8- to 10-W **fuel cell**

CLASSIFICATION CODE: B8410G Fuel cells; B8210 Energy resources; B2575F Fabrication of micromechanical devices; B2575D Design and modelling of micromechanical devices

CONTROLLED TERM: catalysis; chemical reactors; hydrogen economy; microfluidics; micromachining; photolithography; proton exchange membrane **fuel**

cells; sputter etching

SUPPLEMENTARY TERM: hydrogen production microreactor; micro fuel cells; microfluidics; microreformer; system-on-chip; silicon-chip based microreactor; microscale hydrogen production; catalyst-packed parallel microchannels; photolithography; deep-reactive ion etching; filter capping; on-chip heating; temperature sensing; thermal insulation; methanol to hydrogen molar conversion; proton exchange membrane fuel cells; catalytic steam reforming; 8 to 10 W; H

CHEMICAL INDEXING: H el

PHYSICAL PROPERTIES: power 8.0E+00 to 1.0E+01 W

ELEMENT TERMS: W

L52 ANSWER 9 OF 14 HCAPLUS COPYRIGHT 2007 ACS on STN

ACCESSION NUMBER: 2003:364208 HCAPLUS

DOCUMENT NUMBER: 139:135926

ENTRY DATE: Entered STN: 13 May 2003

TITLE: Monolithic integrated fuel processor for the conversion of liquid methanol

AUTHOR(S): Schuessler, M.; Portscher, M.; Limbeck, U.

CORPORATE SOURCE: Ballard Power Systems AG, Kirchheim/Teck-Nabern, 73230, Germany

SOURCE: Catalysis Today (2003), 79-80, 511-520
CODEN: CATTEA; ISSN: 0920-5861

PUBLISHER: Elsevier Science B.V.

DOCUMENT TYPE: Journal

LANGUAGE: English

CLASSIFICATION: 52-1 (Electrochemical, Radiational, and Thermal Energy Technology)

ABSTRACT:

Using a liquid fuel to run a **fuel cell** system becomes more attractive, when a simple and robust fuel processor can be developed. Conversion of a liquid methanol/water-mixture needs process steps to **supply** hydrogen to a **fuel cell.** Based on an approach using new material these processes are combined in an integrated fuel processor (IFP). The authors apply technologies from powder metallurgy like pressing and sintering, to fix catalyst powder and to shape complex functional structures. As a consequence of the new material approach, the IFP can be built as a monolith without any sealing. The good isotropic heat **conductivity** helps to ***thermally*** couple the processes. Exptl. results on a level of .apprx.20 L of hydrogen per min demonstrate the feasibility of the concept. Supported by modeling, alternative schemes of reactor design indicate potential for optimization.

SUPPL. TERM: monolithic integrated fuel steam reforming methanol porous ceramic catalyst; multifunctional reactor catalyst fixation carbon monoxide oxidn

INDEX TERM: Sintering
(at 500-700° to make porous materials; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: **Fuel cells**
Mechanical alloying
Steam reforming
Steam reforming catalysts
(monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: Simulation and Modeling
(of reformate composition from various gas-mixing designs; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: Capillary tubes
(porous, aid **vaporization**; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: Ceramics
(porous, catalysts and gas distributors; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: Models (physical)
(prototypes; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: Oxidation
(selective; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: 7440-50-8, Copper, uses
ROLE: CAT (Catalyst use); DEV (Device component use); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process); USES (Uses)
(catalyst support matrix and device construction; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: 124-38-9, Carbon dioxide, processes 630-08-0, Carbon monoxide, processes
ROLE: CPS (Chemical process); FMU (Formation, unclassified); PEP (Physical, engineering or chemical process); FORM (Formation, nonpreparative); PROC (Process)
(monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: 67-56-1, Methanol, uses 118240-86-1, Methanol/water-mixture
ROLE: CPS (Chemical process); PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: 7429-90-5, Aluminum, uses
ROLE: DEV (Device component use); USES (Uses)
(monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: 1333-74-0P, Hydrogen, uses
ROLE: IMF (Industrial manufacture); RCT (Reactant); TEM (Technical or engineered material use); PREP (Preparation); RACT (Reactant or reagent); USES (Uses)
(monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: 7440-06-4, Platinum, uses
ROLE: CAT (Catalyst use); USES (Uses)
(oxidation catalyst, in alumina-based binder; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)

INDEX TERM: 131064-29-4, Copper zinc oxide
ROLE: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(reforming catalyst; monolithic integrated fuel processor for conversion of liquid methanol by steam

reforming)
INDEX TERM: 1344-28-1, Alumina, uses
ROLE: CAT (Catalyst use); USES (Uses)
(support for platinum; monolithic integrated fuel processor for conversion of liquid methanol by steam reforming)
REFERENCE COUNT: 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD.

REFERENCE(S):
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(2) Anon; DE 19853379 1998 HCAPLUS
(3) Anon; DE 19944187 1999 HCAPLUS
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L52 ANSWER 10 OF 14 INSPEC (C) 2007 IET on STN DUPLICATE 1
ACCESSION NUMBER: 2002:7279583 INSPEC
DOCUMENT NUMBER: A2002-13-8630G-008; B2002-07-8255-002
TITLE: Operating experience with a 250 kWel molten carbonate **fuel cell** (MCFC) power plant
AUTHOR: Bischoff, M.; Huppmann, G. (Energy Technol., MTU Friedrichshafen GmbH, Munchen, Germany)
SOURCE: Journal of Power Sources (20 March 2002), vol.105, no.2, p. 216-21
CODEN: JPSODZ, ISSN: 0378-7753
SICI: 0378-7753(20020320)105:2L.216:OEWK;1-Z
Price: 0378-7753/02/$22.00
Doc.No.: S0378-7753(01)00942-9
Published by: Elsevier, Switzerland
Conference: Seventh Ulmer Elektrochemische Tage (Ulm Electrochemical Days), Ulm, Germany, 26-27 June 2000
DOCUMENT TYPE: Conference; Conference Article; Journal
TREATMENT CODE: Practical
COUNTRY: Switzerland
LANGUAGE: English
ABSTRACT: The MTU MCFC program is carried out by a European consortium comprising the German companies MTU Friedrichshafen GmbH, Ruhrgas AG and RWE Energie AG as well as the Danish company

Energi E2 S/A. MTU acts as consortium leader. The company shares a license and technology exchange agreement with **Fuel Cell** Energy Inc., Danbury, CT, USA (formerly Energy Research Corp., ERC). The program was started in 1990 and covers a period of about 10 years. The highlights of this program to date are: considerable improvements regarding component stability have been demonstrated on laboratory scale; manufacturing technology has been developed to a point which enables the consortium to fabricate the porous components on a 250 cm2 scale. Several large area stacks with 5000-7660 cm2 cell area and a power range of 3-10 kW have been tested at the facilities in Munich (Germany) and Kyndby (Denmark). These stacks have been supplied by FCE; and as far as the system design is concerned it was soon realized that conventional systems do not hold the promise for competitive power plants. A system analysis led to the conclusion that a new innovative design approach is required. As a result the 'Hot Module' system was developed by the consortium. A Hot Module combines all the components of a MCFC system operating at the similar temperatures and pressures into a common **thermally insulated** vessel. In August 1997 the consortium started its first full size Hot Module MCFC test plant at the facilities of Ruhrgas AG in Dorsten, Germany. The stack was assembled in Munich using 292 cell packages purchased from FCE. The plant is based on the consortium's unique and proprietary 'Hot Module' concept. It operates on pipeline natural gas and was grid connected on 16 August 1997. After a total of 1500 h of operation, the plant was intentionally shut down in a controlled manner in April 1998 for post-test analysis. The Hot Module system concept has demonstrated its functionality. The safety concept has been convincingly proven, though in part unintentionally. The electrical power level of 155 kW (ca. 60% of maximum power) achieved allows validation of the concept with reasonable degree of confidence. Horizontal stack operation-an essential innovation of the Hot Module concept-is feasible. The fuel processing subsystem worked reliably as expected. After initial problems in the inverter control software, the electrical and control subsystem operated to full satisfaction. Stable automatic operation not only under various load conditions, but also in idle mode, hot parking mode, and grid-independent mode has been demonstrated. Together with progress achieved by FCE in the qualification of large **direct fuel cell** (DFC) stacks the basis was laid for the next test unit of similar design, which will be operated in Bielefeld,

Germany. The pre-tests of the stack took place in July 1999 with good results. Additionally, projects for the test of the DFC Hot Module operating on biogas and other opportunity fuels are under preparation

CLASSIFICATION CODE: A8630G Fuel cells; B8255 Fuel cell power plants; B8410G Fuel cells

CONTROLLED TERM: **fuel cell** power plants;
molten carbonate **fuel cells**

SUPPLEMENTARY TERM: operating experience; MCFC power plant; molten carbonate fuel cell power plant; MTU MCFC program; MTU Friedrichshafen GmbH; Ruhrgas AG; RWE Energie AG; Energi E2 S/A; Fuel Cell Energy Inc; component stability; manufacturing technology; porous components; Hot Module system; common thermally insulated vessel; Dorsten; pipeline natural gas; safety; electrical power level; horizontal stack operation; fuel processing subsystem; inverter control software; control subsystem; electrical subsystem; hot parking mode; grid-independent mode; idle mode; load conditions; large direct fuel cell stacks; Bielefeld; Germany; biogas; 250 kW; 1500 h; 155 kW; 3 to 10 kW

PHYSICAL PROPERTIES: power 2.5E+05 W; time 5.4E+06 s; power 1.55E+05 W; power 3.0E+03 to 1.0E+04 W

ELEMENT TERMS: S; C*T; CT; C cp; cp; T cp

L52 ANSWER 11 OF 14 PASCAL on STN

ACCESSION NUMBER: 2003-0083030 PASCAL

TITLE (IN ENGLISH): Synthesis and characterization of polyaryl blend **membranes** having different composition, different covalent and/or ionical cross-linking density, and their application to DMFC
International congress on **membranes** and **membrane** processes (ICOM), Toulouse, France, July 7-12, 2002. (Vol.4)

AUTHOR: KERRES J.; ZHANG W.; ULLRICH A.; TANG C.-M.; HEIN M.; GOGEL V.; FREY T.; JOERISSEN L.

CORPORATE SOURCE: Institute for Chemical Engineering, University of Stuttgart, 70199 Stuttgart, Germany, Federal Republic of

SOURCE: Desalination : (Amsterdam), (2002), 147(1-3), 173-178, 11 refs.
Conference: ICOM: International Congress on Membranes and Membrane Processes, Toulouse (France), 7 Jul 2002
ISSN: 0011-9164 CODEN: DSLNAH

DOCUMENT TYPE: Journal; Conference
BIBLIOGRAPHIC LEVEL: Analytic
COUNTRY: Netherlands
LANGUAGE: English
AVAILABILITY: INIST-12906, 354000104733880290

ABSTRACT: In this contribution, different ionomer blend **membrane** types which show high proton **conductivity**, **thermal** stability, and good **direct**

methanol fuel cell (DMFC) performance, are presented: (1) Covalently cross-linked blend **membranes** from polyaryl sulfinates and polyaryl sulfonates where the sulfmate groups were crosslinked by alkylation with 1,4-diiodobutane; (2) ionically cross-linked blend **membranes** from polyaryl sulfonates and poly(het)aryl N bases; (3) covalent-ionically cross-linked blend **membranes** from polyaryl sulfmates, polyaryl sulfonates, and poly(het)aryl N bases; and (4) blend **membranes** which additionally contain an inorganic compound. The inorganic compound was mixed into the **membrane.** As aryl polymers, different poly(ethersulfone)s and different poly(etherketone)s have been used, as hetaryl N base, polybenzimidazole PBI Celazole® has been applied. The **membrane** characterization yielded the following results: (1) high proton conductivities of the **membranes** could be realized; (2) the TEM micrographs showed that phase-separated or homogeneous morphologies could be realized in the **membranes**; (3) the DMFC application of the **membranes** showed that the developed nonfluorinated ionomer **membranes** have a DMFC performance comparable to perfluorinated ionomer **membranes**, reaching peak power densities of around 0.25 W/cm.sup.2 at 110°C. It was also found that the addition of SiO.sub.2 powder dramatically reduced the MeOH permeability, but also led to a worse DMFC performance, probably caused by a worse contact **membrane**-electrode because of a rougher **membrane** surface caused by the inorganic compound.

CLASSIFICATION CODE: 001D10A06J; Applied sciences; Polymer technology, Materials science
001D06D03E; Applied sciences; Energy; Thermal use of fuels
230; Energy

CONTROLLED TERM: Cation exchange **membrane**; Ether copolymer; Ketone copolymer; Sulfonate copolymer; Sulfone copolymer; Aromatic copolymer; Ionomer; Polymer blends; Crosslinked copolymer; Preparation; Crosslinking; Property composition relationship; Proton conductivity; Transport properties; Liquid permeability; Methanol; Use; **Fuel cell**; Experimental study

BROADER TERM: Electrical properties

L52 ANSWER 12 OF 14 PASCAL on STN

ACCESSION NUMBER: 2002-0476513 PASCAL

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TITLE (IN ENGLISH): Modified Nafion®-based **membranes**

for use in **direct methanol fuel cells**
Proceedings of the Ringberg Workshop "Interfacial Kinetics and Electrochemistry", Schloss Ringberg, Tegernsee, Germany, 2000

AUTHOR: DIMITROVA P.; FRIEDRICH K. A.; STIMMING U.; VOGT B.
KOLB Dieter M. (ed.); MAIER Joachim (ed.)
CORPORATE SOURCE: Department of Physics E19, Interfaces and Enemy Conversion, Technische Universitdt Muenchen, James-Franck-Strasse 1, 85748 Garching, Germany, Federal Republic of
University of Ulm, Germany, Federal Republic of; Max-Planck-Institut fuer Festkorperforchung, Stuttgart, Germany, Federal Republic of
SOURCE: Solid state ionics, (2002), 150(1-2), 115-122, 19 refs.
Conference: Interfacial Kinetics and Electrochemistry. Workshop, Tegernsee (Germany, Federal Republic of), 2000
ISSN: 0167-2738 CODEN: SSIOD3
DOCUMENT TYPE: Journal; Conference
BIBLIOGRAPHIC LEVEL: Analytic
COUNTRY: Netherlands
LANGUAGE: English
AVAILABILITY: INIST-18305, 354000104526140100
ABSTRACT: Commercially available Nafion® **membranes** at present do not meet the requirements for high power density **direct methanol fuel cell** (DMFC) applications, amongst others factors because of their high methanol permeability. With the aim of improving the **membrane** properties with respect to this application, a modification procedure has been applied to recast Nafion®-based **membranes. Membranes,** containing different additives namely silicon dioxide particles (Aerosil®) and molybdophosphoric acid, are assessed with regard to their conductivity and methanol permeation rate. The preparation of the samples involves the introduction of a small amount of a high boiling point solvent to the as-received Nafion® solution and then shaping the **membranes** by a recast procedure. An enhancement of the **conductivity** of the **thermally** treated **membranes** in comparison to Nafion® 117 is found. The combined parameter of methanol permeation rate and conductivity of the samples, containing inorganic additives (Aerosil and molybdophosphoric acid), decreases compared with the pure recast and as-received Nafion® **membranes.** The observed results are discussed in terms of the **membrane** structure and preparation.
CLASSIFICATION CODE: 001D06D03E; Applied sciences; Energy; Thermal use of fuels
230; Energy

CONTROLLED TERM: Alcohol **fuel cells**; Methanol; **Membrane**; Permeation; Composite material; Molybdophosphoric acid; Ionic conductivity

L52 ANSWER 13 OF 14 PASCAL

ACCESSION NUMBER: 2003-0062205 PASCAL

TITLE (IN ENGLISH): A pore-filling electrolyte **membrane** -electrode integrated system for a **direct methanol fuel cell** application

AUTHOR: YAMAGUCHI Takeo; IBE Masaya; NAIR Balagopal N.; NAKAO Shin-Ichi

CORPORATE SOURCE: Department of Chemical System Engineering, The University of Tokyo, Bunkyo-ku, Tokyo 113-8656, Japan; Japan Science and Technology Corporation, Kawaguchi, Saitama, Japan; Noritake Company, Limited, Research and Development Center, Miyoshi, Aichi, Japan

SOURCE: Journal of the Electrochemical Society, (2002), 149(11), A1448-A1453, 14 refs.
ISSN: 0013-4651 CODEN: JESOAN

DOCUMENT TYPE: Journal
BIBLIOGRAPHIC LEVEL: Analytic
COUNTRY: United States
LANGUAGE: English
AVAILABILITY: INIST-4925, 354000105401450110

ABSTRACT: To develop a high performance **direct methanol fuel cell**, a novel electrolyte **membrane** is needed. This electrolyte **membrane** should be durable up to 130°C to improve the catalytic reaction, and the methanol crossover should be reduced. Our approach was to design a pore-filling-type polyelectrolyte **membrane**, where the polyelectrolyte is filled into the pores of a porous substrate. This makes an integrated system with a **membrane** and a catalyst layer. The porous substrate was completely inert to aqueous methanol solution and was durable at high temperature. The substrate matrix could suppress **membrane** swelling to reduce methanol crossover, and showed mechanical strength at high temperatures. A radical polymerization technique was employed to fabricate the pore-filling **membrane.** A porous silica sol-gel thin base **membrane** on a carbon electrode was used as a **membrane** -electrode integrated system. The substrate pores were filled with a poly(acrylic acid-co-vinyl sulfonic acid) network. The **membranes** showed high proton **conductivity**, **thermal** stability, and low methanol permeation.

CLASSIFICATION CODE: 001D06D03E; Applied sciences; Energy; Thermal use of fuels

230; Energy

CONTROLLED TERM: Alcohol **fuel cells**; Carbon electrode; Porous electrode; Polymer electrolytes; Polymeric **membrane**; Polyelectrolyte; Sulfonate polymer; Acrylic acid polymer; Benzene(divinyl) polymer; Electrochemical properties; Ionic conductivity; Performance evaluation

L52 ANSWER 14 OF 14 PASCAL on STN

ACCESSION NUMBER: 2000-0278685 PASCAL

TITLE (IN ENGLISH): Inorgano-organic proton conducting **membranes** for **fuel cells** and sensors at medium temperatures

AUTHOR: ALBERTI G.; CASCIOLA M.; PALOMBARI R.

CORPORATE SOURCE: Univ of Perugia, Perugia, Italy

SOURCE: Journal of Membrane Science, (2000), 172(1), 233-239, 27 refs.

ISSN: 0376-7388

DOCUMENT TYPE: Journal

BIBLIOGRAPHIC LEVEL: Analytic

COUNTRY: Netherlands

LANGUAGE: English

AVAILABILITY: INIST-17232

ABSTRACT: Layered zirconium sulfoarylphosphonates of the α- and the γ-type are proton **conductors thermally** stable up to at least 180 °C. In these materials, the sulfophenyl groups are bonded through the phosphorus atoms to an α- or a γ-inorganic framework made of oxygen and zirconium atoms. Compounds where the sulfonic function is attached to a phenyl, benzyl or to a fluorinated benzyl group were characterized for their conductivity as a function of temperature and relative humidity (r.h.). Independent of the layer type, the highest conductivities were found for the sulfophenylphosphonates. The conductivity is strongly affected by the r.h. reaching values of 5 x 10-2 S cm-1 at 100 °C (100% r.h.) and 2 x 10-2 S cm-1 at 150 °C (80% r.h.). Due to their ability to undergo infinite swelling in appropriate solvents, these materials can be incorporated into polymeric proton conducting **membranes.** The possible advantages of these **membranes** for increasing the efficiency of indirect or **direct methanol fuel cells** working at medium temperature are discussed. The use of these **membranes** in gas sensors working at medium temperatures are also discussed. Preliminary results for the detection of hydrocarbons at 300 °C by means of a sensor based on the protonic conductivity of zirconium phosphate are reported.

CLASSIFICATION CODE: 001D07; Applied sciences; Chemical engineering
001C01H; Chemistry; General chemistry, Physical

chemistry; Electrochemistry
001D05C; Applied sciences; Electrical engineering; Materials science
001D08A03; Applied sciences; Chemistry; Chemical industry
001B30; Physics; Atomic physics, Molecular physics
001D06D03E; Applied sciences; Energy; Thermal use of fuels
230; Energy

CONTROLLED TERM: Proton conducting **membranes**; Zirconium sulfoarylphosphonates; Experiments; Conductive materials; Organometallics; Protons; **Fuel cells**; Chemical sensors; Thermodynamic stability; Electric conductivity of solids; Thermal effects; Atmospheric humidity; Swelling; Zirconium compounds; Ion selective **membranes**

=>